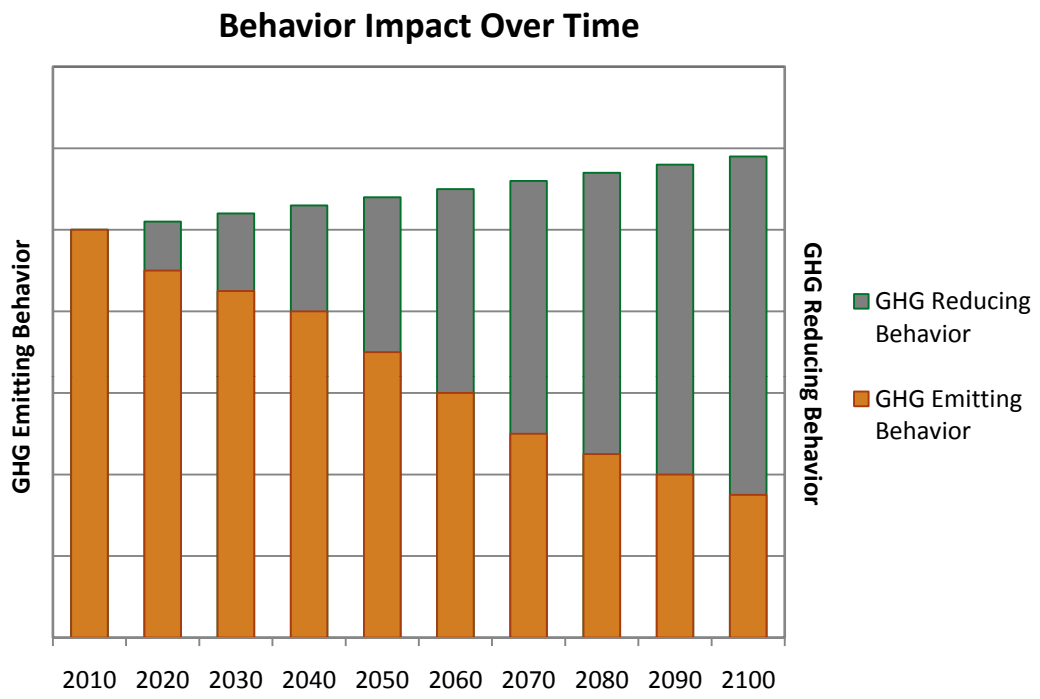
Behavior and Energy Efficiency
Energy Efficiency/Conservation and Grid Vulnerability

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965



Challenge

Transforming the economy to achieve a sustainable supply of clean energy will require transforming people's relationship with power consumption. Over the past 120 years, energy consumption has become increasingly *invisible* to people in residential settings through the evolution of technology, from wood stoves to coal furnaces, finally to oil and natural gas.

Solution

The provision of energy use feedback to end users through intelligent metering systems.

Technical Approach

- Integrated assessment model of consumer energy consumption behavior
- Smart grid and efficiency program analytics
- Understand and predict consumer cognitive and attentional responses to demand-response interventions
- Ability to segment consumer populations
- Analyze electricity loads, time series, patterns of variation
- Analyze/predict persistence, rebound effects

Technosocial Predictive Analytics Initiative

Project Lead: Tom Siaanquist, 206.528.3240 or tom.sanquist@pnl.gov

TPAI Lead: Antonio Sanfilippo, 509.475.2677 or antonio.sanfilippo@pnl.gov

Website: http://predictiveanalytics.pnl.gov

Behavior and Energy Efficiency

Energy Efficiency/Conservation and Grid Vulnerability

Objective

To better define the characteristics of energy feedback so to achieve optimal effectiveness in reducing energy consumption and improving efficiency.

Current Practices

The relationship of human end use energy consumption to smart grid efficiencies involves numerous technical and social-behavioral variables. On the technical side, there are issues related to supply and generating capacity, the emissions characteristics of various types of power plants, variations in supply continuity due to the intermittent nature of wind and solar power, and the relative cost of generating power during peak demand periods. Social-behavioral variables include factors such as attitudes, information, incentives, comfort and convenience. While there have these social-behavioral factors have been shown to reduce energy consumption under specific circumstances, there is little understanding of how behavior and technology may combine on a large-scale to transform the existing energy system.

Behavior and Energy Efficiency Approach

Through this approach, we are developing integrated models of behavior, energy consumption, and climate change. We're also establishing design and analysis platforms for smart grid demonstrations and implementations.

The Transformational Change

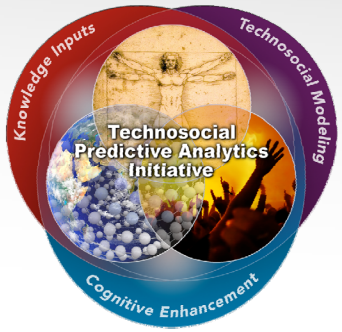
By developing a *behavioral-economic-technical* model, this project will permit evaluation of alternative smart grid implementation approaches, and provide key criteria for the design and assessment of diverse demonstration projects throughout the nation.

Outcomes

- Assess alternative SG deployment strategies.
- Forecast elasticity of behavior across regions.
- Forecast load savings based on specific in-home behaviors.
- Assess impacts on generation mix and portfolio standards.
- Assess impact on GHG emission reduction.
- Evaluate impact of rate structures on consumer preference and behavior.

The Technosocial Predictive Analytics Initiative (TPAI) is taking the next steps to addressing complex, interwoven issues with highly integrated, innovative models to help analysts and policy makers identify and counter strategic surprise.

TPAI supports a multi-perspective approach to predictive analysis through integrated reasoning, drawing knowledge insights from both the natural and social sciences.



Pacific Northwest NATIONAL LABORATORY

Proudly Operated by Battelle *Since 1965*